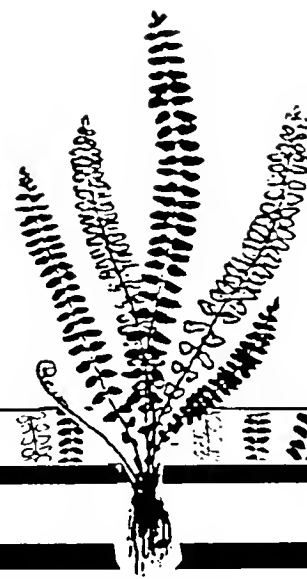


Hardy Fern Foundation NEWSLETTER

Editor Sue Olsen ■ VOLUME 5 NUMBER 2 ■ SPRING 1995



President's Report

Sylvia Duryee

KUDOS to us — The Hardy Fern Foundation! We managed a wonderful display at Seattle's Flower & Garden Show Feb. 20-26th. The project's success was entirely due to Willanna Bradner's efforts and artistic talents! Thanks go to everyone who helped out: to set up, take down, and man our booth! This display created a great deal of interest and an unaccountable number of questions. Hopefully there will be some new members as a result.

We are looking ahead to the use of our portion of the new hoop house at the Rhododendron Species Botanical Garden. Here we hope to grow on some larger specimens for display and spore collection purposes. This brings us to another question: what ferns would you like to have us try to grow for you? We are interested in your ideas and requests. Also, we need goodly amounts of spore of hardy ferns to propagate. From this we hope to supply our Satellite and Display Gardens. Send correspondence re this to Steve Hootman, c/o Rhododendron Species Botanical Garden, P. O. Box 3798, Federal Way, WA 98063-3798.

Looking ahead, we are now planning for the

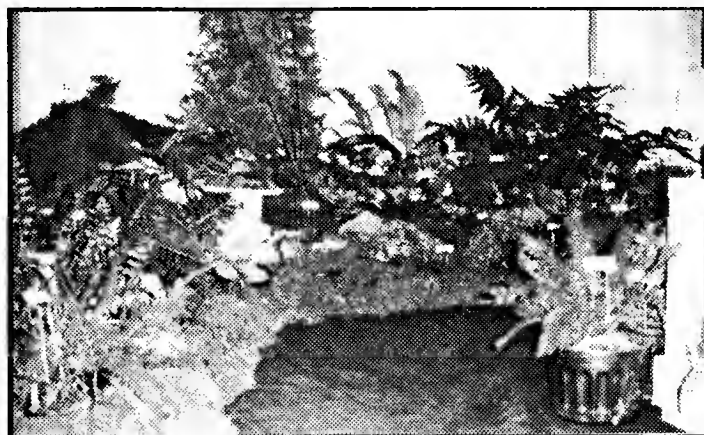
25th Fern Festival to be staged with the Northwest Horticulture Society and hope you plan to attend at the Center for Urban Horticulture.

Friday, June 2nd, there will be a tour of our main display garden from 10:00 to 12:00 at the Rhododendron Species Botanical Garden in Federal Way.

At the Center for Urban Horticulture, the set up time for the sale will be in the afternoon. We would welcome donations from anyone having extra ferns, or volunteer hours (knowledge of ferns not necessary — come and learn!)

Please let us know what you can offer — call me at 1-206-329-2062. Half the proceeds go to us, half to NHS to cover the room use. Your donations help to offer a rounded display and offerings.

Our annual meeting will take place at 6:30 before Ed Alverson's lecture. We are all looking forward to seeing Ed's marvelous pictures



HFF display



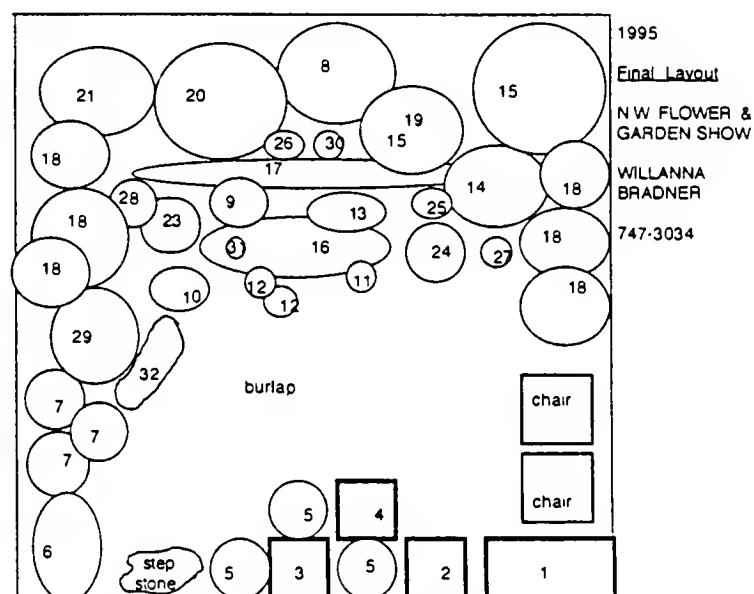
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and discussion about our Northwest natives and their New Zealand counterparts. Ed has been field botanist for 15 years covering many areas: China, New Zealand, Alaska and the Northwest.

The sale begins after the lecture until 9:30 p.m.

Saturday, June 3rd, the sale is open from 10:00 a.m. to 3:30 p.m. We hope to see you all on Friday!



- 1 sd Small fern collection
- 2 Box-24"hi x 12"sq }
- 3 Box-18" hi x 12"sq } for brochures
- 4 Box-21"hi x 12"sq }
- 5 w Polystichum neolobaatum 0- 12"
- 6 so Polypodium vulgare cornubiense - 2'
- 6 sd Polypodium vulgare cornubiense
- 7 so Cyrtomium lonchitoides (3) 12"
- 8 so Pyrrosia shearen
- 9 mk Equisetum Hymale
- 10 mk Cheilanthes eatonii
- 11 w Equisetum scirpoides
- 12 w Selaginella kraussiana - gold tip moss
- 13 w Asplenium trichomanes
- 14 w Dryopteris sieboldii
- 15 so Dryopteris erythrosora
- 16 w Mexican pot rock - holds water
- 17 w Tillamook driftwood 6'wide x 2 hi
- 18 w Adiantum venustum
- 19 so Woodwardia unigemmata
- 20 so Lygodium japonicum - on trellis 5 hi
- 21 w Polystichum setiferum cv
- 22 Burlap & forest moss for ground cover
- 23 w Japanese lantern
- 24 so Phyllitis scolopendrium cv
- 25 sd Dryopteris dickinsii (vparasitica)
- 26 sd Dryopteris cycadena
- 27 sd Blechnum penna-marina
- 28 sd Coniogramme japonica (Bamboo fern)
- 29 sd Polypodium scolieri
- 30 sd Polypodium braunii
- 31 w Azolla caroliniana (mosquito fern)
- Salvinia ariculata
- 32 w Nurse log with Blechnum spicant cedar tree seedling hemlock tree seedling

Fiddlehead Fare

Catherine W. Gules
P.O. Box 335
New Gloucester, ME 04260

Around Mother's Day this year, as in every year in my part of the country, strange things start to happen. Early in the morning, near the loading dock of a large supermarket, where one, perhaps two, 18 wheelers are disgorging pallet-loads of canned goods and provisions, someone pulls up in a beat-up pickup and, hoisting a bulging potato sack, heads for the produce department. After some dickering, the manager takes possession of the sack's contents, and the truck driver is off, perhaps to the nearest mom and pop store for a cup of coffee.

On the same day someone delivers a five-gallon bucket to the kitchen door of a restaurant. Again, some dickering and the seller, pocketing his cash and swinging the empty container, is off.

WHAT'S GOING ON HERE?

It's fiddlehead time in Maine—and throughout New England and Atlantic Canada!

The fiddleheads of the Ostrich Fern (*Matteuccia struthiopteris*) are a wonderful, seasonal delicacy, and the activities of harvesting them, getting them to market, and preparing them for the table coincide with the true beginning of spring. On the East coast, the first fiddleheads of the year are collected in April in Connecticut. By the end of that month, they will start coming from Massachusetts, with supplies following from Vermont, New Hampshire, and Maine. June brings the harvest from New Brunswick and Nova Scotia, and the final pickings from

Labrador in July. Fiddleheads are also gathered in Quebec, Ontario and British Columbia.

HARVESTING

"On my way home from Rangely, I 'botanized' along the way, collecting wildflowers and ferns. The Ostrich and Royal ferns grow inland along stream banks." This quote, dated June 12, 1986, is from the nature and garden diary I keep for my summer cottage. Rangely refers, of course, to the well-known lake-side resort town in Western Maine, in the foothills of the White Mountains. The stream by which I "botanized" was the Sandy River, a tributary of Kennebec. It is in such delightful spots that the Ostrich fern grows, and those who pick the fiddleheads each have their preferred, and usually secret location. Demand exceeds the supply but, unlike wild blueberries, cranberries and even fish and mussels, there is no way that these ferns can be farmed on any scale. If, however, a family has a shady, well-watered location on their land, they can probably plant enough Ostrich ferns to supply fiddleheads for a couple of meals.

In Maine and Atlantic Canada, the fern commerce is particularly associated with the Native American tribes of the region—the Penobscots, Passamaquoddys, Mic Macs and Malaseets—some of whose members gather fiddleheads in spring, rake wild blueberries in August, and pursue other seasonal occupations.

Like all crops, fiddleheads vary in abundance from one year to the next. The controlling factor seems to be the water level of the rivers and streams. In years when the spring water level is high, the pickers have a longer season because fiddleheads keep popping up as the water level slowly recedes. If the water level is

low to begin with, the fiddleheads "emerge everywhere simultaneously and the pickers cannot harvest as many as they could otherwise" (Lovell, 1986). When harvesting, the pickers only take a few fiddleheads from each plant, thus ensuring that it will produce a crop each year.

In addition to Ostrich fern fiddleheads, the newly awakened land here offers other wild spring greens: dandelion greens (*Taraxacum officinale*), yellow rocket (*Barbarea vulgaris*, also called yellow cress or winter cress), lamb's-quarters (*Chenopodium album*), orach (*Atriplex patula*), and marsh-marigold (*Caltha palustris*, also called cowslip).

Fiddlehead gathering is not without its dangers. A Maine newspaper reported last spring that one Ed Holman hired five teenagers to pick fiddleheads for him on some islands in the Androscoggin River. At 7:30 a.m., on a rainy day, Holkman ferried or had someone else ferry, the pickers to the islands and then left them there. At about 12:30, a woman who lived on the shore opposite the islands heard the youngsters hollering; they were cold, wet and wanted to go ashore. Authorities rescued the group's members, one of whom was suffering from hypothermia and was taken to a local hospital! A police officer told the reporter that the youngsters were inadequately dressed for the weather.

MARKETING

Once the fiddleheads are picked, they must be quickly delivered to a buyer because they have a short shelf life, two days usually given as the maximum. As a result of calls and inquiries made in the spring of 1994, I learned that markets paid the pickers from \$1.00 to \$2.25 per lb. then sold them at \$1.69 to \$4.99 per lb. The cheapest retail price I found was on

a sign in front of a house in Auburn, Maine: \$1.50 per lb.

Lets add some names and faces to these impersonal numbers. Dave Rodrigue works in the produce department at a Shop 'n Save Supermarket — one of the stores of the Hannaford Corporation — in Auburn, Maine. During a season that can last from two to four weeks, this market sells between 30 to 40 lbs of fiddleheads a day. These are purchased from pickers who come to the store — according to the scenario described at the beginning of this article. On the day of our conversation, the price was \$3.99 per lb.

Jonathan Chase, the owner and chef of Jonathan's, a highly appreciated restaurant in coastal Blue Hill, Maine, buys fiddleheads both from people who show up at his establishment's back door and from those who are selling them from trucks parked along the main roads. He buys in 10- or 20-lb. lots and probably purchases between 100 to 150 lbs per season. Last spring, he paid between \$1.75 to \$2.00 per lb.

Because Blue Hill plays host to many tourists who have never eaten fiddleheads, Chase serves them as the vegetable accompanying the entree. He added that a favorite Mother's Day menu is shad roe — another spring delicacy — and fiddleheads. Yum! All he could say about his suppliers was that they come "from inland."

There is at least one Maine firm which acts as a middleman in the fiddlehead trade, and has a cannery as well. According to Lovell's (1986) article, W. S. Wells & Sons, of Wilton, ME processed 24 tons of fiddleheads in 1985. Of this amount they canned some 40 percent under their "Belle of Maine" label and sold the remaining supply to markets from New England to California.

Should you wish to order freshly picked fiddleheads by mail, write or call Chris Holmes at New Penny Farm, P.O. Box 448, Presque Isle, ME 04769 (1-800-827-7551). His supplier, Simon Clair, a Mic Mac Indian, harvests about 500 lbs. annually from the banks of Presque Isle Stream. Holmes then packs them in cooled styrofoam boxes and sends them by second-day air express throughout the United States and even to Alaska! Holmes said that the demand increases each year, but that Clair and his family are able to deliver the supplies he needs. As Presque Isle is in the center of Maine's potato-growing region, Homes also offers a mail-order Potato-of-the-Month Club. His brochure, available from the above address, gives full information.

COOKING

What do fiddleheads taste like? The best comparison is with asparagus, also a spring delicacy. Others note that the flavor carries hints of artichokes, spinach and broccoli. I cook them by steaming them until they are tender — certainly no longer than 10 minutes — and then serving them with a little butter and grated parmesan cheese.

In addition to restaurateur Jonathan Chase's book, *Saltwater Seasonings: Good Food from Coastal Maine*, which he wrote with his sister, Sarah Leah Chase, here are two others that offer recipes for fiddleheads. *The L. L. Bean Book of New New England Cookery*, by Judith and Evan Jones, contains 21 recipes which call for fiddleheads. Interested readers might also try to obtain *The New Maine Cooking: Serving Up the Good Life*, by Jean Ann Pollard. Recipes from these three books appear at the end of this article.

Finally, a warning. I believe that fern

experts must, by now, be aware that Bracken (*Pteridium aquilinum*) is a toxic plant. Yet the word is slow to reach the public. *The L. L. Bean Book of New New England Cookery*, cited above, lists Bracken, along with the Ostrich and Cinnamon (*Osmunda cinnamomea*) ferns, as a source of fiddleheads; and the 1961 English edition of *Larousse Gastronomique* says, "The young shoots of certain ferns (such as the Male fern and Bracken) are edible. . . p. 410.

The University of Maine Cooperative Extension has published a bulletin (No. 4060) defining which wild greens are edible and which are not, and it lists only the Ostrich and Cinnamon ferns in the former category. In addition, writers on this topic frequently refer to Elizabeth Schneider's *Uncommon Fruits and Vegetables*, which strongly discourages the consumption of Bracken and notes that the Ostrich fern is the one most frequently found in markets.

This past September (long after the fiddlehead season!) the Centers for Disease Control and Prevention warned that fiddleheads should not be eaten raw, and they recommend boiling for 10 minutes. Reports of digestive upsets caused by consumption of raw or undercooked fiddleheads caused this agency to issue this recommendation. It is unclear from their warning, however, whether their experts were concerned about fiddleheads taken from the banks of polluted streams or about the possible toxicity of the plants themselves.

CELEBRATING

For the past twelve or so years, Unity College, in Unity, Maine, which is near Waterville, and the Maine Trappers Association have held the Maine State Fiddlehead Festival. According to staff

continued on page 16

Fiddlehead Fare *continued from page 15.*

members of the college with whom I spoke, this spring event featured a feast built around fiddlehead recipes. In addition to fiddlehead salads, soups, and quiches, participants could enjoy fiddlehead cookies and cupcakes! And like such festivals everywhere, there was music and an opportunity for craftspeople to display their offerings.

Alas, the festival is not being held in 1995; however, it is likely that it will be revived another year. If so, your reporter will attempt to submit an account with a Unity dateline.

SPRING FEVER

As I finish this article, I have become aware of signs around our yard of another approaching spring. An astonishingly early bluebird was investigating a nesting box on about March 15 and on the same date, a single snowdrop was blooming in front of a stone wall. No signs of fiddleheads yet, but it won't be long.

Information for this article was largely gathered from interviews and newspaper articles. In the former category, I would like to thank Chris Holmes, Jonathan Chase, Susan Lovell, John Sullivan and Dave Knupp, of Unity College, and Bill Merrill, Bill Lohman, Dave Rodrigue, Dick Dube, Jim Frey and Donna Aucoin, all of whom were working last spring in various grocery stores.

Among the newspaper articles, I would like to cite the following:

"A boiling warning for fiddlehead ferns." *USA Today*, September 23, 1994, p. 6D.

Hanson, Tim. "Chilly youths plucked off river islands". *The Sun-Journal*, Lewiston, ME. May 5, 1994, p. 1,6.

Lovell, Susan. "A Treat from the Wild" *Maine Sunday Telegram*, May 4, 1986, p.6D

Lovell, Susan. "Fiddlehead Magic." *Portland Press-Herald*, April 25, 1994, p. 1C-2C

Riely, Elizabeth. Edible Ferns of New England." *New York Times*. Sunday, May 8, 1988, Travel Section, P. 6.

Wigglesworth, Zeke. "Even devout veggie haters learn to love fiddleheads." *Bangor Daily News* August 25, 1955, p. 23.

RECIPES

NOTE; *Prior to cooking fiddleheads, remove the brown husk covering them by rinsing them in cold water. Trim the stem ends with a sharp knife.*

From *Saltwater Seasonings*. by Sarah Leah Chase and Jonathan Chase. (Boston: Little Brown and Company, 1992, 192 p.)

Fiddlehead Soup

- 4 tb (1/2 stick) unsalted butter
 - 2 fat leeks, washed, trimmed, and minced
 - 2 carrots, peeled and minced
 - 1 clove garlic, minced
 - 1 tsp dried tarragon
 - 4-1/2 cups water
 - 1 cup dry white wine
 - 3 medium potatoes, peeled and cut into 1/2-inch cubes
 - 3 cups fiddleheads, cleaned and cooked until tender
 - 1-1/2 cups half-and-half
 - Salt and freshly ground pepper, to taste
1. Melt the butter over medium heat in

a stockpot. Add the leeks, carrots, and garlic. Saute until quite soft, about 10 minutes. Add the tarragon and cook a minute more.

2. Pour the water and wine into the pot and add the potatoes. Place half of the cooked fiddleheads in a blender or food processor and puree until smooth. Stir into the soup. Simmer the soup uncovered, stirring occasionally, until the potatoes are tender, about 30 minutes.

3. Add the remaining cooked fiddleheads to the soup along with the half-and-half. Season the soup with salt and pepper and continue to simmer about 10 minutes more to warm throughout and mellow the flavors. Serve hot, ladled into soup bowls.

Serves 6 to 8.

From *The L. L. Bean Book of New New England Cookery*, by Judith and Evan Jones. (New York: Random House, 1987. 669 p.)

Corkscrew Pasta and Vegetable Salad

- 1/2 green pepper, cut in strips
- 1/2 sweet red pepper, cut in strips
- 2 Tb chopped fresh herbs, such as parsley, scallions, basil or tarragon, or marjoram
- 1 dozen fiddleheads, cleaned and cooked 8 minutes (these authors recommend steaming them or boiling them "in a good quantity of boiling water" for 7 to 8 minutes").
- 1 cup broccoli florets, cooked until just tender
- 6 scallions, including tender greens sliced thin
- 1/2 lb. corkscrew pasta, cooked al dente

Dressing

2 tsp lemon juice

1/4 tsp salt

Freshly ground pepper

2-3 drops sesame oil

1/4 cup olive or vegetable oil

Toss all of the salad ingredients together in a large bowl. In a separate bowl or jar with a screw top, mix or shake all the dressing ingredients together. Pour the dressing over the salad, mix well and serve: don't refrigerate. Serves 4.



"Belle of Maine" canned fiddleheads sold by W. S. Wells & Sons of Wilton, ME.

Yankee Fiddlehead Pie (or Quiche)

4 eggs

1 cup milk

1 cup chopped and cooked fiddleheads

2 Tb chopped cooked leeks

1/2 Tb chopped parsley

1 cup shredded mild
Maine cheddar

Salt

One 9 or 10-inch partially baked pie
shell (they refer the reader to their
recipe for Basic Pie Dough, found
on p. 564 or their book).

8 whole cooked fiddleheads

Beat the eggs with the milk until blended. Fold in the chopped fiddleheads, leeks, and parsley, and half of the grated cheese. Season with salt to taste. Turn into the partially baked shell and sprinkle with the remaining cheese. Decorate the edge with the whole fiddleheads. Bake in a preheated 350-degree oven for 40 minutes, or until done. Let rest 10 minutes before serving. Serves 8.

The Alaskan Relative

Renee G. Hill
Bellevue, WA

Many years ago, as a child growing up in what was then the very small coastal town of Juneau, Alaska, fiddlehead ferns were a treasured spring delicacy. After a long winter with few fresh edibles, their distinctive flavor and wildness brought a much needed awakening.

I well remember being loaded with a small bucket and trudging out the door to garner fiddlehead ferns. In those halcyon days, it was simply a matter of a few feet to nature — ours was the last house on the hill at the edge of 'town' which stopped there on the foothills of one of the lesser mountains. I believe even now, many years later, the urbanization goes no further up that particular hill, the growth in the capitol city has been spectacular, with more and more of the entire area covered with homes, businesses, malls, and urban sprawl. I wonder if the fiddleheads are still 'safe' for the picking?

The Alaska of my youth was quite primitive, with food and supplies arriving by small coastal boats with limited amenities. Meats were frozen, vegetables of the long-keeping varieties, with perhaps an occasional cabbage. Today the shopping malls and food stores rival any to be found anywhere, produce arrives daily by air from all around the world. Many fine restaurants serve a demanding public.

The fiddlehead is not forgotten, however. A very successful restaurant in Juneau bears its name, and fiddleheads are a featured specialty on their menu.

In 1962, during the Seattle World's Fair, we were guests at the Space Needle Restaurant here which was celebrating its opening. The proffered vegetable was *Fiddlehead ferns*, an enjoyed bit of nostalgia!

MATTEUCCIA *struthiopteris*

ma tū si a strū thi op ter is

James Horrocks
Salt Lake City, Utah

Ostrich Fern

Originally, this fern was named *Osmunda struthiopteris* by Linnaeus in 1753. In 1818 it was assigned to the genus *pteris* (species: *nodulosa*) which has been rather widely used even up until recent years. In 1866, Todaro gave it the name *Matteuccia* in honor of an Italian naturalist and that name is now accepted. The species name *struthiopteris* literally means "ostrich fern", very descriptive for the outline of the fronds. The genus *Matteuccia* seems to be only vaguely related to other groups, in fact, its relationship to other taxa is merely presumed for the most part.

There are three recognized species of *Matteuccia* and possibly a fourth (Rush) all native to the temperate parts of the northern hemisphere. These include: *Matteuccia intermedia* from China, which is perhaps not strikingly different from *M. struthiopteris*, *Matteuccia orientalis* from Japan, Korea, China, and the Himalayas, with smaller, more drooping sterile fronds, and finally *Matteuccia struthiopteris* which is found in North America, Europe, and in eastern Asia. Lellinger mentions that according to Morton (1950) the American variety differs from the European form in having concolorous, rather than bicolorous scales with a black central stripe. The American variant is usually designated as *Matteuccia struthiopteris* var. *pennsylvanica*, but it should be mentioned that even within this group there can be found subtle

differences, depending upon what part of the country they come from. The Ostrich fern may be confused with the Cinnamon fern *Osmunda cinnamomea*, but the most obvious difference lies in the outline of the frond, which is like that of an ostrich plume in the Ostrich fern.



Matteuccia struthiopteris - young fiddleheads and old fertile fronds.

The range of the American Ostrich fern is from Newfoundland across Canada to British Columbia and north to Alaska, south to Northern Missouri and across to Maryland and the Virginias. It does not occur naturally in the western United States and becomes rare south of Latitude 41°. It is found growing in swamps, river bottoms, alluvial flats and thickets, and on moist wooded slopes. It is among the tallest North American ferns. The author encountered a magnificent stand just outside Montreal, Canada in a swampy area, the enormous fronds being fully eight feet in height!

Description: The rhizomes are dimorphic (Lellinger) with long-creeping, horizontal portions that form at intervals very stout erect crowns that produce a large vase-shaped cluster of fronds. The stipe bases are clothed with lanceolate, pale brown scales. The fronds are strongly dimorphic. The large deciduous sterile

fronds, which appear first, are pinnate-pinnatifid, deeply cut into scythe-shaped segments. The fronds can be from two to seven or even eight feet high, depending on habitat, and from 6 inches to as much as 20 inches across. The frond apex is obtuse, that is, rather rounded like an ostrich feather. Fertile fronds appear later in the summer and are much shorter than their sterile counterparts. Their stipes are nearly equal in length with the blade, crescent-shaped in cross-section and shiny brown. The fertile blade is from 6 to 12 inches in height and from one to three inches wide, the green color turning dark brown, with crowded, thick, underrolled pinnae which resemble segmented worms. The sori are on

rather long receptacles which are at right angles to the abaxial surface of the fertile segments. The spore cases are like two tiny gun-barrels (Clute) one on each side of the midvein. There is no indusia. The dark brown spores are retained all winter, then released the following spring.

Culture: Without question, this is one of the most adaptable ferns in cultivation. It is an attractive subject for a large garden and is quite impressive when allowed to grow in large colonies. However, in a smaller garden, it can become a nuisance, its spreading habit choking out more delicate species. It reflects its care and, as has been noted, can reach truly enormous size in swampy acid conditions, although it is more often at home in moist circumneutral soils. In climates

that are less humid to semi-arid, the Ostrich fern holds its own, although by August it tends to look rather dilapidated if the summers have been hot and dry. It is certainly not as sturdy as, for example, the Male fern, *Dryopteris filix-mas*. The fiddleheads of the Ostrich fern are the most commonly eaten ferns in North America and are said to taste rather like asparagus. If there is ample room in the garden, this is a rather interesting and, to say the least, vigorous fern, the flushes of new fronds being quite attractive.

References:

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Philadelphia

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Herbert Durand
G. P. Putnam's Sons
New York

A Field Manual of the Ferns and Fern- Allies of the United States and Canada

David B. Lellinger
Smithsonian Institution Press
Washington, D. C.

Encyclopedia of Ferns (1987)

David L. Jones
Timber Press
Portland

A Guide to Hardy Ferns (1984)

Richard Rush
British Pteridological Society
London

Editor's notes

The article "Hybrid Hi-Jinks" by Dr. Joan Gottlieb in our last newsletter has generated a very enthusiastic response including the following letter from Dr. Irving Knobloch.

Also there are three corrections - on page 5 the labels for *xAsplenosorus pinnatifidus* and *Camptosorus rhizophyllus* are interchanged; also on page 5 column 3 "Intra-specific pollen competition..." should read "Inter-specific..."; finally on page 8 column 1 "*Polystichum acrostichoides*" should of course read "*Polystichum acrostichoides*". The editor apologizes for the errors.

More on Hybrids

Irving Knobloch, Professor Emeritus Michigan State University

The article on hybrid ferns by my friend Joan Eiger Gottlieb was not only long-overdue but it was one of the best summaries that I have seen and it brought back some memories. I recall vividly the struggle between Dr. Thomas Morgan, a voluble champion of mutation and Dr. Edward C. Jeffrey who was the leading advocate of hybridization as a factor in evolution. I, myself, still think that these mechanisms are both important. Be that as it may, the leading plant symbol of mutation, *Oenothera lamarckiana*, was found to be a natural hybrid.

Another famous figure was Dr. Ernst Mayr who wrote voluminously and decried hybridization (admittedly less common in land animals), but if you read his book you will find that there are some hybrid birds.

Coming back to ferns - in 1976 I published a 79 page booklet listing 620 reputed hybrids, some from the early 1800's. Early identification methods were not nearly as precise as they are today but my booklet has all of them in it as an historical document. Some copies may still be available for \$5.00 from the Michigan State University Museum. However, I have published 3 supplements in various journals. I have put these in order in the 1976 booklet plus many new ones noted in the 2nd volume of the FLORA OF NORTH AMERICA (Oxford Press). This compilation should be saleable but will have to await solicitation from a publisher.

Dr. Gottlieb is perfectly correct in stating that hybrids were considered impossible. In fact it was almost blasphemy to even suggest that plants had SEX. Now most know that hybrids are common in plants - in ferns my unpublished list has over 1100. Some are sterile, some become fertile by doubling their chromosome number, at least 50 sterile ferns have diplospores (normal) and agamosporous taxa by-pass sexual fusion entirely.

Finally, the question has been raised - does crossing really cause advancement (new characters?) It has been suggested that characters are determined by enzymes and that if genes from two taxa co-mingle, new characters might arise because new enzymes would be formed. Are intermediate characters found in hybrid ferns NEW characters?

A Systematic Method For Spore Germination

Samuel Tumey, Liberty, MS

I approach the subject of spore germination with some hesitation because there are any number of articles in print which make the process seem to be

- a.) So easy that an idiot can do it; or
- b.) So difficult that it should be considered more art than science and success attributed to beginner's luck.

I understand that many readers have developed a technique which works for them, and, as a result, will not be interested in further assistance. This article is for those who have not attempted to grow ferns from spores, who have not had success, or who are still seeking a satisfactory and convenient method. In the past twenty years since I was a graduate student (where I had wild-eyed ideas about looking for bioactive compounds from prothallia) I believe I have tried almost every published method except the use of sterile agar. Most methods worked to one degree or another. My justification for the method which I am about to describe is that it was developed expressly for the ordinary gardener with no knowledge of ferns. The initial concept was to produce and market a pre-packaged kit which would allow the purchaser to follow a few simple directions and obtain a pot full of baby ferns. The kit was unmarketable for reasons unrelated to spore germination, but I believe my experience with spore cultivation for non-experts can be of some value.

Step 1: Collection and preparation of spores. The standard methods of spore preparation need not be reviewed in detail. I do not sterilize my spores, because on a liquid medium it is usually unnecessary. In the rare event where the spore leaf is extremely dirty, I prefer to the

wash the frond while it is still fresh rather than wash the spores. I clean my dried spore material by tapping it on a sheet of magazine paper. Most of the chaff will bounce off the end of the paper and most of the spores will stick to the paper. However, if you attempt to germinate the clean spore material and throw away the chaff, you may throw away the viable spores. Unless you know that your clean spore material will germinate, you should retain the discarded sporangial material for possible later use. In the case of Dryopteris in particular, the viable spores often remain attached to the sporangia and have to be germinated with the accompanying junk material. For safety's sake, shelf life of non-green spores should be considered to be slightly less than one year, although some may last longer. Better to germinate spores as soon as it is convenient to do so. Avoid contamination with other species where possible. Bear in mind that the common species got that way, that is to say common, by being able to dominate their habitat, and this includes inhibiting growth and reproduction of the prothallia of less vigorous species. Thelypteris is a common offender in this regard. One or two spores of some of the more vigorous species may be sufficient to substantially reduce the yield of a rare or valuable culture.

Step 2: Germination. I use a sterile solution of Hyponex Plant Food (7-6-19). Almost any fertilizer solution would probably serve as well. However, some fertilizer solutions are artificially colored. A colored solution would obviously be inconvenient for viewing the prothallia in their early stages of germination. Concentration is of little or no importance, and I generally estimate the amount of fertilizer. I have germinated several lime-dependent species on this medium without adding calcium or adjusting the pH, and have had good success.

I use old-fashioned glass petri dishes, spared from the trash heap many years ago when labs went over to the plastic variety. Any oven-proof glass container will work just as well. (There are now available at your shopping mall miniature Pyrex or Corningware casserole dishes which are very similar to Petri dishes in size and shape.) Containers are filled with nutrient solution and sterilized by heating for 120 seconds in the microwave. (Before microwaves, I sterilized them in the oven.) **Caution!** This will be a superheated liquid and the dissolved material has already raised the boiling point of the solution considerably. Treat it with the respect which this implies!

Allow the solution to cool, then dust the spore material over the top of the solution. Rigorous sterile procedures, such as would be required in microbial cultures, are not essential as long as general rules of cleanliness are observed. The spores will float on top of the surface of the water held up by surface tension. The containers can even be moved around without any danger of sinking the spores. Cover the containers and place under artificial light. White light is fine, and special grow lights are not necessary. Depending on species, spores may germinate in one to four weeks. You may lift the cover and observe with a hand lens as you wish.

The young prothallia can be removed almost as soon as desired after germination. However, they will be easier to work with if removed before they form a thick mat. It is important to understand that the prothallia are now in a race with algae, which is also beginning to germinate on the liquid medium. At the first sign of discreet threads of algae, you must make plans to remove the prothallia to solid medium. The algae will not ordinarily harm the prothallia, but, if allowed to spread over the surface of the

liquid medium, will cause inconvenience in removing and transplanting the prothallia. In rare cases, you may wish to remove prothallia to another container of clean nutrient solution, but this will allow a grace period of only about a week before algae again overgrows the medium. Better to transfer to solid medium the first time around.

Step 3: Transfer to solid medium.

Most people use soil for their solid medium. However, I consider my customized inorganic medium to be superior to sterilized soil. I use the proprietary term "Gorilla Gravel" for this medium.

TO MAKE ONE PIE PLATE FULL OF GORILLA GRAVEL

1. Use clean Pyrex Pie Plate ten inches in diameter.
2. Add 1/2 cup of Vermiculite.
3. Add 1/2 cup of commercial cat litter. Note: I borrow my cat litter from the bag before it goes into the litter box. I prefer the generic variety without the little green odor absorbing pellets, but have not noticed that they inhibit germination or growth.
4. Add 1/8 cup of Canary Gravel from the pet store or grocery.
5. Add 1/8 cup of Ground Charcoal from the local garden center or pet shop. Caution! Don't breathe the charcoal dust.
6. Mix all this thoroughly with a spatula.
7. Add 1/8 teaspoon of garden lime.
8. Add 1/8 teaspoon of powdered commercial fertilizer. Hyponex is fine.
9. Add 1/8 teaspoon of powdered Aluminum sulfate.

10. Mix thoroughly with a spatula.

11. Place pie plate in oven at 350 degrees for about one hour. At the end of the hour raise the oven temperature to 400 momentarily and then allow the oven to cool at its own rate before removing the pie plate. Note: If the household chef must have the oven, protracted cooling isn't absolutely essential. I just like to get my money's worth out of the cooking session in the hope that I can perhaps bake that last stubborn fungal spore to death.

You now have just about the best inorganic medium that money can buy. It holds water well without becoming gooey and buffers out at a pH of just under 7. I don't make any effort to buffer it up for lime-loving species. It has worked fine for Adiantum species which later required lime supplementation as adult sporophytes.

Now you need a container. It may be that any old container will do as long as it's clean and transmits light. However, I have two observations on this point. First, plastic is better than glass. The reasons are not entirely clear. I believe it has to do with the fact that polymer sheets are porous at the molecular level. Remember: Your cola will go flat in a plastic bottle, but it used to keep its fizz indefinitely in the old glass ones. I believe that one of two factors are at work. Either gas transfer to and from the container favors green plants over molds, or micro currents are created which prevent the fungal spores from settling. A third possibility is that organic polymers are better insulators. Glass is cold and clammy to the touch while plastic is not. This would have an effect on the condensation cycle and may be a factor in mold growth. I am unaware of this subject having been addressed in the literature on spore germination.

Better results are also obtained if provision is made for diffusion and circulation of air through the medium itself. This can be accomplished by exposing a portion of the medium to the air, i.e. an inverted jar over a dish which is slightly wider than the jar. (Think of using an inverted petri dish, where the large part marked "Cover" is actually used for the bottom and the part marked "bottom" is actually the top and rests on the medium rather than forming a glass to glass seal.) Satisfactory results can be achieved by cutting out the middle portion of a soft drink bottle, placing solid medium in the bottom part, then fitting the top and bottom portions together without the middle. When using this arrangement, a layer of perlite should be placed in the bottom of the bottle for drainage. For my growing containers I use little rubberized polystyrene trays that chemical laboratories use for weighing samples. These are available from chemical supply companies for about four cents apiece. I use one for the top and one for the bottom. The top half is inverted, and the two fit together to form an enclosed container. However, the lips where the top and bottom meet do not fit tightly, and air is thus allowed to pass in and out of the container, but solid particles, such as mold spores, will ordinarily bump into the side of the container rather than passing into the growth chamber. The containers can be washed and reused at least once before they disintegrate from exposure to light but I always use a brand new set if the spore culture is valuable. I bought a thousand of these little trays a few years ago for about forty dollars and expect them to last the rest of my life.

I place about a quarter inch of Gorilla Gravel in the bottom of a tray. Then I dip the prothallia out of the liquid medium with a plastic spoon and drop them at random onto the solid medium. (A metal

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A Systematic Method for Spore Germination *continued from page 21.*

spoon is awkward because the prothallia develop static charges and tend to run from the spoon.) Avoid the temptation to spread the prothallia too thickly because they will increase considerably in size.

The trays need to be watered about once a week. I use tap water which I have sterilized by heating for 120 seconds in the microwave. This keeps down contamination from fungi and algae. Ordinarily the prothallia need no additional encouragement to mate and produce baby ferns. I find that *Dryopteris* sometimes has to be exposed to genuine sunlight followed by a bath from a medicine dropper before fertilization will occur.

I sometimes transfer the young ferns directly to prepared beds in the woods, taking care to cover them with plastic drink bottles for the first year. If it is inconvenient to transplant outside, I transfer them to rectangular trays filled with a mixture of potting soil and sand. Even when transplanted inside, the young ferns need to be covered with drink bottles because either central heat or air conditioning will dry them out. I place a priority on moving my ferns outside into the soil as soon as possible, because, like a litter of puppies, they are cute when little but they become a pain to care for as they grow bigger.

I find that the above procedure is one that can be used with confidence. Of course, there is always the odd chance of fungal contamination or desiccation due to neglect. However, as a general rule, by sowing spores using the above procedures, it is possible to know with reasonable certainty that viable spores will yield a good culture. In the case of ferns collected in the wild, it has been my experience that enough spores to dust two plates, usually from only one spore-

bearing frond, will provide more baby ferns than the grower will have the patience to transplant.

Pellaea Viridis

A Hardy Orphan or Evolution at Work?

Don L. Jacobs, Ph.D -
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For nearly 20 years *Pellaea viridis* has been a permanent resident of a rock garden at Eco-Gardens near Atlanta, Georgia. Sporelings appear spontaneously in crevices, and along lower edges of large rocks. Depending on site, mature fronds may be a mere 9", or attain 2 feet in length. The dark stipes, and vibrant green pinnae add lushness to the semi-exposed garden.

Like most plant species, *Pellaea viridis* varies considerably in appearance, and undoubtedly also in physiology. Native to east Africa, near-by islands, and the West Indies, it is generally assumed to be a tender tropical for conservatories, or useful as a durable, evergreen house plant. This prevailing evaluation is consistent in virtually all horticultural literature dealing with ferns. It is surprising, therefore, that my sanity seems to be in question, when I describe the 'Eco-Gardens' plant as a deciduous fern, hardy in zone 7 and probably to zone 6. Siting the plant along the lower edge of boulders, where moisture and temperatures are more beneficial, is to its liking but it also prospers in open ground. Without mulch or unusual protection *Pellaea viridis* has withstood full exposure in Eco-Gardens,

to an extreme low of -8°F. (average minimum = +5°F.) Winters here are typically modest, with only one or two snowfalls lasting one to four days, and frost penetrating less than three inches into the ground. First freezes seldom arrive before mid November, and the last freeze can be expected about the first of April. Under these conditions, *Pellaea viridis* usually goes fully dormant in early December, and new croziers do not appear until the ground has warmed in early May.

In 1974 and 75 several forms of *Pellaea viridis* were introduced into a South-facing rock-garden slope shaded only at mid-day by a giant Southern Red-Oak. Variety *glauca* has 2-3 pinnate 12-18 inch fronds with rather small blue-green leaflets. Variety *macrophylla* has fewer, much larger, dark green leaflets. Both of these forms came originally from East Africa, but different sites. The third, and perhaps more common, form came from Puerto Rico. Only this form has persisted and become naturalized. I have had little experience with the other forms since, and would rather not speculate as to their adaptability in temperate gardens. It is likely that a natural selection has been occurring in the garden, and that the current population, several generations after the introduced plants, has been screened for hardiness survival. I am testing this by distributing plants as 'Eco-Gardens' cultivar to gardeners in hardiness zones 6 and 7 across the country. More time will be required to evaluate reports.

Specimens developing in crevices, and more exposed sites, with limited root-run, spread 9" fronds horizontally, and are usually only once-pinnate. In moister, shady sites, the 2-foot fronds stand quite erect, are fully twice-pinnate, and basal pinnae may be thrice-pinnate. These blades are about 14" x 6", but in rich soil

under conservatory culture the 3-pinnate fronds may attain nearly twice these dimensions.

Has *Pellaea viridis* evolved into a choice, hardy garden fern? Will it remain an orphan among gardeners? Only time will tell - I await your verdict.

About the Author: Don L. Jacobs holds a PH.D. degree in Ecology from the University of Minnesota; he has taught that subject as well as other related biological sciences at Mankato State College and the University of Georgia. His interests and fields of expertise cover a wide range of subjects from aquarium fish diseases, their diagnosis and treatment, to plant geography, and field ecology. He has been retained by many public and private institutions to prepare eco-

logical surveys. He served on the team employed to make an ecological survey of the Oak Ridge Atomic Energy Plant Site. He has made extensive plant collecting trips throughout China, from Eastern Mongolia to Xishwangbana, Japan, Taiwan, Thailand, Singapore, central and western Europe as well as most of North America. Some of these collections have become valuable additions to American Horticulture. He has numerous publications in print covering a wide range of subjects, some geared to the layman while others are learned treatises for the academician. He is the founder of Eco-Gardens (Price lists - \$2.00) for the research and display of native and exotic plants growable in the Piedmont of the Southeast and for the propagation of endangered species.



*Hardy
Fern
Foundation*

The Hardy Fern Foundation Newsletter is published quarterly by the Hardy Fern Foundation, P.O. Box 166, Medina, WA 98039-0166.

Articles, photos, fern and gardening questions, letters to the editor, and other contributions are welcomed!

Please send your submissions to Sue Olsen, 2003 128th Ave SE, Bellevue, WA, 98005.

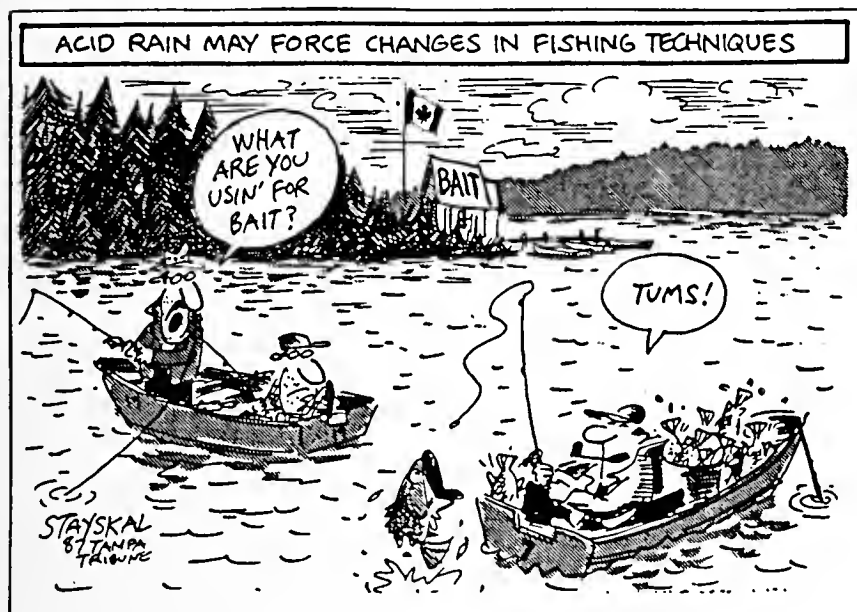
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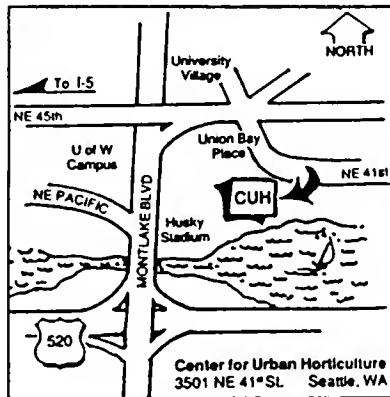


search in each category. You'll find quotes from leading studies citing an extensive and growing list of problems and problem areas. But this is not just a book of statistics, Dr. Knobloch has also compiled an array of suggested solutions and cures for many of the ills he describes (a refreshing change from works that criticize but offer no suggestions for corrective action). His appendices include A: "What You Can Do" and B: "Organizations to Consider Supporting" so that the reader has specific options and opportunities to address environmental problems. This is Dr. Knobloch's 7th book and it is indeed a work that will stimulate discussion and perhaps better yet action. It is for all of us and available for \$12.00 directly from Dr. Irving W. Knobloch, 6104 Brookhaven, East Lansing, MI 48823-2216. SSO

Livable Planets are Hard to Find

By Irving W. Knobloch, PhD

This is not a fern book, but the author Michigan State University Professor Emeritus Dr. Irving Knobloch is a Hardy Fern Foundation member and what he has to say is important to people everywhere not just fern growers. The sub heading "An Overview of our Terrestrial Home for the Layperson" sums up Dr. Knobloch's intent and his philosophy that we MUST increase our efforts to protect our earth, and all its inhabitants and habitats. To this end he has gathered an incredible amount of information from various studies throughout the world. His topics are familiar - water, food, air, soil, tropical rainforests and non-tropical developments with wide comprehensive re-



1995 Fern Festival co-sponsored by the Hardy Fern Foundation and the Northwest Horticultural Society.

FRIDAY JUNE 2 (10:00 AM - NOON) FERN TOUR at the HFF display garden at the Rhododendron Species Botanical Garden, Federal Way, WA

In the shady areas of the garden interspersed with trees and rhododendrons you will see an extensive collection of athyriums, cyrtomiums, dryopteris and polystichums. Osmundas and woodwardias are in the moist beautifully serene area by the pond. Up the slope look for rock garden ferns in the alpine area. These are but a few of the ferns in this beautiful garden.

6:30 PM CENTER FOR URBAN HORTICULTURE, SEATTLE - ANNUAL MEETING HARDY FERN FOUNDATION followed at 7:30 PM by our speaker Ed Alverson who will talk about "Pacific Northwest Ferns and Some New Zealand Counterparts". Ed has a master's degree in botany and has been a botanist for 15 years. He is a steward for the Nature Conservancy and has travelled extensively. His photographs are outstanding.

FERN SALE - will take place the evening of June 2 and continue on June 3 from 10:00 AM to 3:30.

See you there!

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